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Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

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May 2, 1978

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MEMORANDUM

TO: All Interested Parties
FROM: Michael D. Roach, Chief, Air Quality Bureau
SUBJECT: Ambient Air Quality Standards

As you may know, the Air Quality Bureau is in the process of drafting new ambient air quality standards. The old regulations, which had been in effect since the passage of the Montana Clean Air Act in 1967, were found to be legally questionable.

The attached document explains the problems with the old regulations and deals at length with the plans of the bureau to develop new standards.

This document and subsequent working papers on the development of standards for various pollutant groups is being sent to you because of your interest in ambient air quality standards. Other recipients include representatives of industry, the environment, and the public.

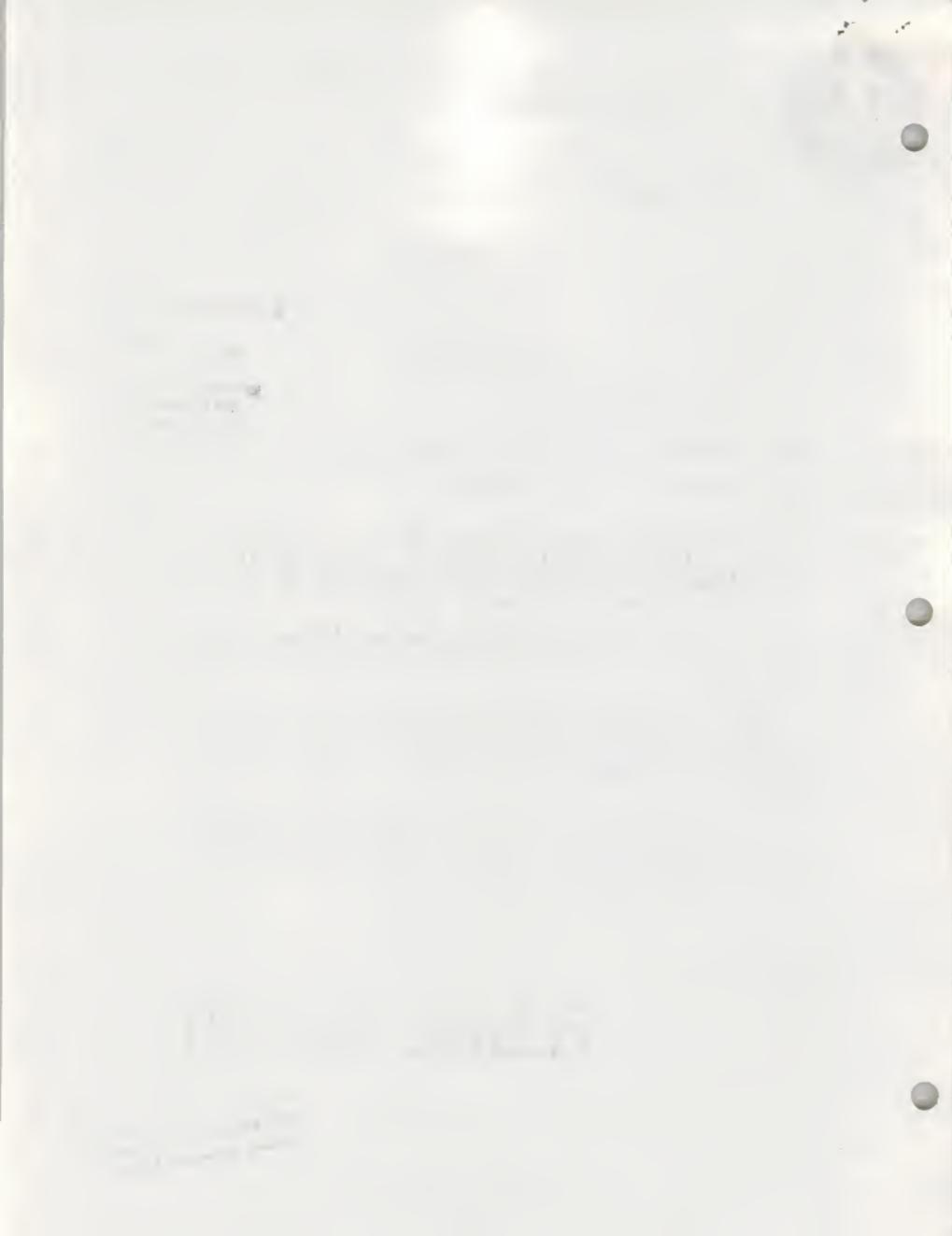
We are asking that you send us your response to this document by May 19. Working papers on specific pollutant groups will be sent to you as they are completed. Comments should be specific and critical or analytical rather than philosophical.

MDR:DV:kh

Attachment

PLEASE RETURN

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Montana Ambient Air Quality Study

ISSUES AND RESPONSE

Working Paper Number One for Developing
Enforceable Ambient Air Quality Standards
for the State of Montana

State of Montana
Department of Health and Environmental Sciences
Environmental Sciences Division
AIR QUALITY BUREAU

May, 1978



PART I : WHY MAAQS? AN OUTLINE OF THE PROBLEM

In the fall of 1977 the Department of Health and Environmental Science was contemplating enforcement action against some Montana industries for violations of an administrative regulation, ARM 16-2. 14 (1) -S14140 entitled "Ambient Air Quality Standards." In researching the basis for possible law suits on the violations, it was discovered that the 1967 Montana Clean Air Act mandated the Board of Health to promulgate ambient air quality standards within 90 days of its enactment - a short time for a complex task. In carrying out this mandate the Board of Health relied heavily upon the expertise of the federal Department of Health, Education and Welfare.

Upon adopting Rule S141040, the Board said: The board, in adopting these standards, intends them to be goals and guidelines and so interprets the legislative intent of the word "standards" in section 69-3909 of the Clean Air Act of Montana.

Therefore, the board adopted "goals and guidelines" rather than enforceable standards. Furthermore, in the same rule, standards also were referred to as "air quality criteria." It is important to distinguish between "air quality criteria" and air quality standards":

Air quality standards are a way of implementing air quality criteria as actual requirements for performance, polluters or potential polluters. Air quality standards are prescriptive; they prescribe pollutant levels that cannot legally be exceeded during a specific time and a specific geographic area. They are an expression of public policy rather than scientific findings, their development from air quality criteria will be influenced not only by concern for protection of health and welfare, but also by economic, social, and technological considerations.

Air quality criteria, on the other hand, are an expression of the scientific knowledge of the relationship between the various concentrations of pollutants in the air and their adverse effects on man, animals, vegetation, materials, visibility, and so on. Air quality criteria can and should be used in developing air quality standards. Criteria and standards are not synonymous. Air quality criteria are descriptive; that is, they describe the effects that can be expected to occur whenever and wherever the ambient air level reaches or exceeds a specific figure for a specific time period. (Emphasis added)

When this matter was brought to the attention of the Board of Health and

Environmental Sciences in December 1977, the board told the department it wanted Montana to have enforceable ambient air quality standards. There are a number of opinions concerning the meaning of the term "enforceable standards." To begin with, there is the Environmental Protection Agency approach premised on the federal Clean Air Act. Federal ambient standards have been adopted by EPA.

It is EPA's position that the Federal Act does not authorize the issuance of an order or the collection of a civil penalty for violations of ambient standards. Instead, EPA holds that federal ambient standards are enforceable only against the 50 states' pollution control agencies which are required by law to implement the Act. Thus, if a federal ambient standard is being exceeded, EPA will direct the state to revise its state implementation plan and emission regulations to assure compliance with the federal ambient standards.

If a state refuses to act, EPA will adopt a rule of its own prescribing emission regulations which will control pollution concentrations within the federal ambient standards. In other words, it is EPA's position that federal ambient standards are not directly enforceable against the source. It must be pointed out, however, that if a single major source were violating ambient standards EPA could promulgate a rule to force compliance.

In discussions concerning violations of the state ambient air rule during the past few years, prior to the emergence of the goals and guidelines issue, the department has held that the Montana ambient rule is enforceable directly against a source. Although the EPA approach of controlling emissions always has been embraced by the department as the primary method of achieving compliance with ambient standards, the department has insisted that other enforcement procedures are available under the Montana Clean Air Act.

There are three such procedures as follows:

1. The adoption of emission regulations for a specific source or sources to assure compliance with the ambient standards (the basic EPA approach);

2. The issuance of enforcement orders against a source or sources for violations of ambient standards.
3. The initiation of a civil or criminal action against a source or sources in district court for the collection of a penalty when an ambient standard has been violated.

In December 1977 the board directed the department to begin the task of developing ambient air standards for review and eventual adoption by the board. To this end, the department obtained a budget of \$147,000 and established the Montana Ambient Air Quality Standards Study (MAAQS) to re-examine Montana's ambient air quality rule. The purpose of the study will be the proposal of ambient air quality standards based on the best scientific, technical, economic, environmental and social data reasonably available.

PART II: OPTIONS AND CONSTRAINTS

The major objectives of the MAAQS project are to develop ambient air quality standards which are enforceable, scientifically based, and developed with an appreciation of the economic and environmental conditions in Montana.

MAAQS must operate within the legal framework for air pollution control and environmental protection for the state. The framework is provided by Section IX of the 1972 Montana Constitution, and statutes enacted within the last ten years.

The 1972 Montana Constitution provides in Article IX:

Section 1. Protection and improvement. (1) The state and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations.

(2) The legislature shall provide for the administration and enforcement of this duty.

(3) The legislature shall provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and adequate degradation of natural resources.

The Clean Air Act of Montana, R.C.M., 1947, 69-3901 et seq., provides the legal authorization for enactment of ambient air standards. Section 69-3909 (5) of the act requires of the Board of Health and Environmental Sciences to "establish ambient air standards for the state." Policy objectives which must be considered by the board in adopting these standards are stated in Section 69-3905 of the Act:

(1) It is hereby declared to be the public policy of this state and the purpose of this Act to achieve and maintain such levels of air quality as will protect human health and safety, and to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this state, and facilitate the enjoyment of the natural attractions of this state.

(2)...

(3) To these ends it is the purpose of this Act to provide for a coordinated state-wide program of air pollution prevention, abatement, and control; . . . and to provide a framework within which all values may be balanced (sic) in the public interest.

This report is called a "criteria" document. At the same time the actual standard is proposed. Following a period of public review and comment, the standard is formally adopted.

Public Health Questions

The federal law requires that the primary standard must "protect the public health" with "adequate margin of safety." The secondary standard must protect "the public welfare" from "any known or anticipated adverse effects." The public welfare is defined to include "effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being."

Several questions can be raised on the meaning of these phrases. For example, what is "the public health?" Does it just include obvious illness, or does it include very subtle physiological effects? Should only the middle-aged person in good health be protected or also the very young, the very old, or the already ill person? Considering these and other such questions will help in the decision as to what air quality standards Montana should adopt.

Who Should be Protected

Who should be protected from air pollution? When air quality standards were first proposed by Governor Goodwin Knight of California in 1954 he urged that they should include the effects on "elderly chronic invalids." The California standards adopted in 1959 were intended to respond to the needs of "persons in the population who are most sensitive to air pollution effects." In writing the 1970 amendments to the federal Clean Air Act, Congress took the same tack. In the senate report the committee emphasized that "included among those persons whose health should be protected by the ambient standard are particularly sensitive citizens such as bronchial asthmatics and emphysematics." This would mean that even aggravation of pre-existing disease is to be considered.

Federal Primary and Secondary Standards

In 1970, the Congress amended the federal Clean Air Act to require national ambient air quality standards to be adopted by the Environmental Protection Agency. The amendments specified that these were to be the minimum acceptable standards; the states clearly retained the authority to adopt more stringent standards.

Montana law requires standards be adopted which will protect human health and safety (without qualification) and property and the environment (with consideration given to economic feasibility). The federal law split these two aspects into two separate standards with the federal "primary" standard designed to protect health, and the more stringent "secondary" standard to protect the environment.

The federal law requires that each state develop a plan to insure that the national standards will be achieved throughout the state. It requires the primary standards to be met within three years after EPA approves the state plan and the secondary standards to be met in a "reasonable time." The definition of a "reasonable time" depends on how expensive and complex it is to control the pollutants, but is not to be more than a few years after the primary standards are met. For example, a new federal standard for lead is expected to be adopted this year. That will mean that the primary lead standard must be achieved in Montana by 1982, if it takes a year to write and approve the plan. But the secondary standard might not be achieved until 1984 or later.

If Montana does not submit a plan to achieve a national standard, the EPA is required to impose a plan. If the state does not meet the standard, or if it fails to enforce the plan, various federal grant programs can be cut off, such as highway funds or community development funds.

The process for adopting a federal standard begins when the EPA publishes a report on the "the latest scientific knowledge" about the pollutant and its effects on health and the environment.

Acute Pollution Effects

It also must be asked what constitutes "health affects." Exposure to some air pollutants can result in immediate, visible tissue damage or even death (e.g., chlorine gas exposure in an industrial accident). At pollution levels often found in the ambient air, eyes can be irritated, throats become scratchy, or asthma is aggravated. These are termed "acute" effects. Long-term exposures to very low levels of some pollutants can also have adverse effects. Such effects may be as obvious as cancer or so subtle that they are only found by comparative analysis of death rates and causes among communities alike except for their exposure to pollution.

Chronic Pollution Effects

These long-term impacts are called "chronic" effects. The senate report quoted earlier addressed this point specifically. It said, "ambient air quality is sufficient to protect the health of persons whenever there is an absence of adverse effect on the health of a statistically related sample of persons in sensitive groups from exposure to the ambient air."

It can be extremely difficult to know at what concentration a pollutant will not have chronic effects. Because we cannot experiment on human subjects as we do on laboratory animals, it is very hard to get useful information on exposure effect relations known to be applicable to humans. Humans cannot be kept in controlled environments for long periods and the various tissues cannot be examined for damage with the same thoroughness. As a result, testing for low level effects is often possible only through surveys to determine the effects of pollutants or by measuring physical-chemical changes in the body. In the east European countries and the Soviet Union ambient air quality standards usually are based on physiological measurements as modification in the alpha rhythm of brain waves or secretions of enzymes. In the United States, at least one federal air quality standard was based on a subtle change in central nervous system activity. Because it is difficult to

know if such a change is a harbinger of a long term effect or only a harmless response to a external simulii, it is prudent to err on the side of caution and consider such effects in setting the standards.

The Threshold Concept

The concept of an air quality standard seems to imply that there is some safe level, below which there is no effect. When such a "threshold" exists, it is possible to expose a whole population to any amount of the pollutant less than the threshold for a very long time (even a lifetime) without any adverse consequences. This reason for the emphasis on this approach in public health legislation. For some pollutants there may be no threshold. That is, even the smallest measurable amount of the pollutant can still cause an adverse effect. For such a substance the tolerable exposure is zero. Most substances which cause cancer are now believed to be "no-threshold" compounds, although a certain time of exposure may be necessary to cause the effects.

Because medical research on pollutants at these low levels is difficult, it is hard to be certain an effect is adverse or even if it exists. Is absolute certainty necessary before action is taken, or is it enough to suspect that a pollutant may be dangerous? One court case interpreted the federal law to require only that the pollutant "may reasonably be anticipated to endanger public health or welfare." The court had said that this type of language implies a strong precautionary stance. "Regulatory action may be taken before the threatened harm occurs; indeed the very existence of such precautionary legislation would seem to demand that regulatory action precede and, optimally, prevent, the perceived threat." The Montana Clean Air Act contains similar language when it defines pollution to include a situation which "tends to be injurious to human health or welfare."

Margin of Safety

The federal law requires that a "margin of safety" be included in the primary

standard. In part this is to protect the public from as yet undiscovered effects; in part it is to protect from unusual meteorological conditions which might cause a sudden high concentration of the pollutant. How much margin of safety to include in a standard must relate to the risk society wishes to bear. Obviously, different groups in society will be prepared to assume different levels of risk. For example, those helping make a decision will accept a higher risk than those who feel the risk is being imposed on them without their consent. The perceived magnitude of the anticipated event and the personal benefits from taking the risk also will affect the evaluation of the needed margin of safety.

Engineers who deal with known loads and materials may use margins of safety from 1.5 to 10 times those necessary for safety. The Food and Drug Administration claims to use a factor of 100. The Nuclear Regulatory Commission has used safety factors of 100,000 to 1,000,000. State law does not specifically require the setting of a safety margin, and the policy regarding the possible need for such a margin will be developed along with the standards.

Economic Considerations

The Montana Clean Air Act requires that the selection of a level to protect property and the environment must include consideration of what is economically "practicable." That is, the cost of achieving the cleaner air must be a major element in the decision. Just how much consideration must be given to economic factors has been the subject of numerous court cases. Unfortunately, there is very little guidance. All that is clear is that the decision makers must have relatively complete cost benefit analyses.

It has been argued that to make a decision on an air quality standard some sort of benefit-cost analysis must be made. Such an analysis is extremely difficult to do. On the cost side, the actual installation cost and the possible operating and maintenance costs can be calculated for a specific control procedure at a specific plant, but extending that estimate to a different level of control or

a different plant can be very misleading. Additionally, these numbers may not measure the full costs.

Similarly, the measurements of benefits can be exceptionally difficult. It is hard to measure the amount of illness or environmental damage from a particular pollution concentration and it is almost impossible to assign a dollar value to health or life. For example, the value of health is not merely the cost of medical services or lost wages. Most people would be willing to pay far more than the cost of a visit to the doctor to avoid a three-day siege of the flu. Even if there is no local human population to be impacted by the pollution, high but unknown costs might be imposed on environmental systems. Many forms of pollution travel long distances, causing significant effects at considerable distance.

Environmental effects take many forms. Wildlife may be affected by pollutants much the same as humans. Strongly acidic pollutants may have profound effects on lakes and streams or even soils. Plant damage is a commonly observed effect of even low levels of air pollution. Certain pollutants can discolor the sky, obscure visibility, and possibly even affect rainfall and other climatic patterns. The costs of these changes could be large, as if for example, there were a change in the length of the growing season due to a reduction in the sunlight reaching the ground.

PART III: WORK PLAN FOR STANDARD DEVELOPMENT

Public Participation

The Montana Administrative Procedure Act, Title 82, Chapter 42, R.C.M., 1947, contains applicable provisions which dictate notice requirements regarding publication of the proposed rule and allows for a hearing on the rule proposed by the department prior to any final adoption by the board. Therefore, under the Administrative Procedure Act, the public is assured of participation in the rule-making process between the time the rule is proposed and the adoption of the ambient air standards by the board.

In order to inform the public and facilitate citizen participation prior to promulgation of the department's proposed ambient air standards the department will develop an environmental impact statement (EIS) under the Montana Environmental Policy Act, R.C.M., 1947, 69-6501 et seq. The EIS will facilitate compliance with the policy of the Montana Clean Air Act and will set the stage for the subsequent hearing on the proposed ambient air standards.

The preparation of the standards will comply with the citizen participation requirements of the Montana Administrative Procedure Act, Section 8204226 et seq. These requirements implement Article II, Section 8 of the Montana Constitution which guarantees the citizens of this state an opportunity to participate in the major decisions of state government. The issuance of an EIS and the subsequent hearing process is consistent with these requirements.

During the public participation phase of MAAQS, the opinions of concerned industries, the public, and various interest groups will be requested. The experiences of other states in developing standards will be evaluated. All reasonably available scientific and technical data will be reviewed and objectively examined. Leading experts on ambient air pollution matters will be consulted.

Following evaluation of the relevant data and consultation with experts, controversial value judgements will be required to arrive at the standards. In the process

of developing the standards, there will be emphasis on the major aspects of decision making; the analytical treatment of explicit information, and consideration of the consequences of a range of alternative choices, all performed as part of an open and accessible decision making process.

The draft EIS will show how technical data, value judgments, and assumptions were used in arriving at conclusions. This type of analysis can provide a framework for discussions and for identification and consideration of the critical issues by all those concerned. Analysis from outside MAAQS can aid in the decision-making process by assuring that the decision makers are aware of alternatives, consequences, and the uncertainties involved. MAAQS by necessity will put a great dependence on existing scientific data. It is important that early and routine review be made to insure that all levels of information are considered, and to reduce the possibility of misinterpretation or misuse of scientific results. Provisions will be made for independent scientific advice and evaluations of the technical basis for any decisions.

It is recognized that there will be uncertainties in the available information. Exposing these uncertainties, however, can be of advantage to the study both in providing a realistic view of the state of knowledge, and in providing guidance in areas where additional design and consideration must be done. MAAQS will systematically identify alternative courses of action and their consequences. Effects of alternatives will be described.

Project Organization

Thus, the thrust of MAAQS is the implementation of a state policy to achieve and maintain air quality at a level sufficient to protect human health and to the greatest degree practicable prevent injury to plants, animals, and property with due consideration of economic and social conditions that might be affected.

MAAQS will be conducted by the bureau on a project basis under the chief of the bureau who will serve as MAAQS project manager. The project manager will have the overall responsibility for all financial and technical aspects of the project.

He will exercise direct line management and supervision over the effects officers and consultants and direct the activities of the steering committee. Consultant selection generally will be agreed to by all members of MAAQS.

A steering committee made up of section heads of the bureau and a representative of the legal division has been selected to integrate MAAQS with the normal functions of the bureau. Specialties represented on the committee include control measures and implementation, data and technical information, sampling methods, legal considerations, and public impact and participation.

Ad hoc members of the scientific and engineering community will be selected to review this work plan and the working papers on the various pollutants. They will be asked to critically review these documents to assist MAAQS in finding gaps in data or other short comings in the analyses. This work plan and subsequent working papers also will be sent to each member of the Board of Health, the Air Pollution Advisory Committee, interested members of the public and EPA.

Outside Consultants

Time and financial constraints are important considerations in the MAAQS project. MAAQS views consultants as an adjunct in providing assistance in grappling with the immense amounts of technical information dealing with air pollutants and their effects. Consultants also will bring expertise to MAAQS through their knowledge in their special fields. This expertise will be an invaluable base from which important value judgments will be made. Well founded standards will result when recognized authorities have had a chance to participate in the MAAQS decision-making process.

Working Papers

In developing the standards, MAAQS will seek the views not only of experts and scientists, but of ordinary citizens with an interest in air pollution.

As the standards are developed, working papers will be sent out to inform the public of the feelings that have been generated through data review and consultation with experts.

These papers will not contain specific numbers, but will be intended in part to assist MAAQS in determining the concerns of citizens. The schedule for publication, subject to some flexibility, is as follows.

For: Lead and beryllium	May 5
Carbon Monoxide, hydrocarbons, nitrogen oxides, ozone.....	May 10
Fluorides.....	June 16
Sulfur containing compounds.....	August 4
Particulates and visibility.....	September 16

Pollutant Evaluation

A consideration of cause and effect relationships between pollutants and the environment are an important part of the MAAQS evaluation process. To ensure that an understanding of these relationships is available as a basis for decisions on the standards, there will be a careful reviews of the current literature on pollutant effects. Further, present and past source and ambient sampling data will be compiled and consultants knowledgeable in particular specialized areas will be called in for additional advice. All pollutants currently listed by law, plus urban pollutants and respirable particulates, will be included for study.

The information generated in this portion of the project will be available for future use through entry into the standards and effects subsystem of the air resources modeling system to be developed by the Montana Air Pollution Study.

This system will provide rapid and easy access to literature and data generated through MAAQS and be available for updating on a continual basis in the future. Each of the standards proposed will include a method for its detection and measurement.

Literature Search

To enable a thorough review of the present standards and the proposed alternatives, literature review will be completed for each pollutant. This, will be issued as a document outlining scientifically based cause-effect relationships

each pollutant has on 1) human health, 2) vegetation, 3) animals, 4) aesthetics, 5) inert materials, 6) visibility. Sources of this information are available through the federal government (APTIC), scientific journals, and the university and state libraries. MAAQS will attempt to cover the most recent scientific documentation in this search.

Although the whole gamut of literature will be reviewed, only information providing the most direct evidence regarding effects of a given pollutant and/or pollutant concentration(s) over a specified time period will be emphasized. In the case of vegetation and animal effects, controlled toxicological and fumigation work will be used in conjunction with field experimentation to clearly elucidate the cause-effect relationships. For the health effects, epidemiological and health case studies will be emphasized.

The literature review further entails an investigation of the historic and present sampling data available from the AQB. Only then will the cause-effect literature be accurately interpreted in the light of Montana's unique air quality problems and agricultural and natural resource constraints.

Trace Metals

Pollutants evaluated are lead (Pb) and beryllium (Be). Beryllium is rarely found in Montana and therefore is not a priority within the MAAQS time schedule. It nevertheless warrants a comprehensive literature review and benefit cost analysis to ensure the adoption of a manageable standard. Lead on the other hand is an important pollutant and will be given careful analysis through the general literature review and subsequent economic analysis. It is important to note that lead pollution will be analyzed to determine the impact of the proposed federal standard on point sources.

Urban Pollutants

Although Montana is predominantly a rural state, there are populated areas where urban pollutants could pose a potential problem. It is necessary for MAAQS

to evaluate monitoring data regarding the present levels found in these areas and review what effect these values may have on the health and welfare in Montana. The urban pollutants evaluated in this section will consist of nitrogen oxides (NO_x), carbon monoxide (CO), Ozone (O_x) and hydrocarbons (HC).

Fluorides

Airborne fluorides are found in significant concentrations in some Montana industrial areas. Unlike other pollutants, fluorides have the ability to initiate effects in secondary consumers within the food chain through trophic level accumulation. As a result, Montana has established a regulation for fluoride accumulation in vegetation. Regulations also are in effect for total fluorides in air and gaseous fluorides.

Sulfur Compounds

Significant ambient air pollution in Montana is due to sulfur dioxide (SO₂), hydrogen sulfide (H₂S) and their oxidation products. Therefore, it is important that a thorough investigation be made and standards proposed for these compounds to ensure a high level of air quality for Montana citizens. The sulfur compounds for which standards will be considered are sulfur dioxide, hydrogen sulfide, and sulfate (SO₃ and SO₄).

Particulates

Particulates evaluated will fall into the two categories already determined by law total suspended particulate (TSP), and settleable particulate. Standards for respirable particulates also will be considered and may be proposed.

Economic Analyses

An entire spectrum of analytic procedures is available for laying out the social costs and benefits of alternative ambient air quality standards. At one extreme is cost-benefit analysis with costs and benefits specified and estimated with considerable precision.

This approach depends for its validity on the availability of large amounts of reliable and fairly precise data. The state of the art of pollution control and damage cost assessment is such that this approach, seldom is possible or appropriate.

The approach taken by MAAQS will differ with each pollutant according to the amount of information available and other variables. The sophistication and reliability of the results will be determined in part by the information, time, and other resources available. A flexible approach is necessary to cope with variables in data availability, the magnitude of potential impacts in Montana for each pollutant, and other unpredictable considerations.

Use of Cost-Benefit Information

The role of economic analyses in MAAQS is to bring obtainable data and economic reasoning to bear on the problem of setting ambient air quality standards for Montana. In the development of such standards, economics is vital in providing decision makers with an appropriate array of relevant data, along with analytic capacities for evaluating it. Neither the economic analysis nor the analyst will make the final decision in setting the standards, however. The appropriate role of economics and the economist is facilitating informed and rational decision.

